# APPLICATION FOR OSHPD SPECIAL SEISMIC CERTIFICATION PREAPPROVAL (OSP)

| OFFICE USE ONLY | |
|---|---|
| APPLICATION #: | OSP-0303-10 |

## OSHPD Special Seismic Certification Preapproval (OSP)

**Type:** ☐ New ☒ Renewal

## Manufacturer Information

Manufacturer: Kohler Power Systems

Manufacturer's Technical Representative: Adam Dykstra

Mailing Address: 444 Highland Drive, Kohler, WI 53044

Telephone: 920-457-4441 Email: Adam.Dykstra@kohler.com

## Product Information

Product Name: Kohler Power Generators

Product Type: Electrical Power Generators

Product Model Number: 60kW-500kW REOZJ, 550kW REOZV, 2500kW-3250kW REOZD
(List all unique product identification numbers and/or part numbers)

General Description: Diesel Powered Electrical Generators. Seismic enhancement made to the test units and modifications required to address anomalies observed during the tests shall be incorporated into the production units.

Mounting Description: REOZJ: Rigid Floor Mounted Generators With Internal Isolators On or Off UL142 Fuel Tanks With or Without Enclosures. REOZV: Vibration Isolated Open Generator Mounted on Spring Isolators. REOZD: Vibration Isolated Open Generators Mounted on Spring Isolators.

## Applicant Information

Applicant Company Name: The VMC Group

Contact Person: John P. Giuliano, PE

Mailing Address: 113 Main St, Bloomingdale, NJ 07403

Telephone: 973-838-1780 Email: john.giuliano@thevmcgroup.com

I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2013.

Signature of Applicant: _____ Date: 7/2/13

Title: President Company Name: The VMC Group

## California Licensed Structural Engineer Responsible for the Engineering and Test Report(s)

Company Name: The VMC Group

Name: Ken Tarlow California License Number: SE2851

Mailing Address: 113 Main St, Bloomingdale, NJ 07403

Telephone: 973-838-1780 Email: ken.tarlow@thevmcgroup.com

## Supports and Attachments Preapproval

☐ Supports and attachments are preapproved under OPM- _____
(Separate application for OSHPD Preapproval of Manufacturer's Certification (OPM) of Supports and attachments is required)

☒ Supports and attachments are not preapproved

## Certification Method

☒ Testing in accordance with: ☒ ICC-ES AC156

☐ Other (Please Specify): _____

## Testing Laboratory

Company Name: UC Berkeley-PEER

Contact Name: Wesley Neighbour

Mailing Address: 1301 South 46th Street, Building 420, Richmond, CA 94804

Telephone: 510-665-3409 Email: wdn@berkeley.edu

Company Name: Clark Testing Lab

Contact Name: J.R. Antenucci

Mailing Address: 1801 Route 51, Jefferson Hills, PA 15025

Telephone: 412-387-1001 Email: jrantenucci@clarktesting.com

## Seismic Parameters

Design in accordance with ASCE 7-10 Chapter 13: ☐ Yes ☐ No

Design Basis of Equipment or Components ($F_p/W_p$) = 2.25 $S_{DS}$ @ z/h = 1.0, 0.75 $S_{DS}$ @ z/h = 0.0

$S_{DS}$ (Design spectral response acceleration at short period, g) = Varies, See Attachments

$a_p$ (In-structure equipment or component amplification factor) = 2.5

$R_p$ (Equipment or component response modification factor) = 2.0

$\Omega_0$ (System overstrength factor) = 2.5

$I_p$ (Importance factor) = 1.5

z/h (Height factor ratio) = 0.0 and 1.0 (See Attachments )

Equipment or Component Natural Frequencies (Hz) = See Attachments

Overall dimensions and weight (or range thereof) = See Attachments

Equipment or Components @ grade designed in accordance with ASCE 7-10 Chapter 15: ☐ Yes ☒ No

Design Basis of Equipment or Components (V/W) = _____

$S_{DS}$ (Design spectral response acceleration at short period, g) = _____

$S_{D1}$ (Design spectral response acceleration at 1 second period, g) = _____

R (Response modification coefficient ) = _____

$\Omega_0$ (System overstrength factor) = _____

$C_d$ (Deflection amplification factor) = _____

$I_p$ (Importance factor) = 1.5

Height to Center of Gravity above base = _____

Equipment or Component Natural Frequencies (Hz) = _____

Overall dimensions and weight (or range thereof) = _____

Tank(s) designed in accordance with ASME BPVC, 2010: ☐ Yes ☐ No

## List of Attachments Supporting Special Seismic Certification

☒ Test Report(s) ☐ Drawings ☐ Calculations ☒ Manufacturer's Catalog

☐ Other(s) (Please Specify): _____

## OSHPD Approval (For Office Use Only) – Approval Expires on December 31, 2019

Signature: _____ Date: 8/7/13

Print Name: M. R. Karim Title: SHFR

Special Seismic Certification Valid Up to : $S_{DS}$ (g) = See Above z/h = See Above

Condition of Approval (if applicable): _____

# Table 1 - Open & Enclosed Generators On Tanks (External Rigid Mounting)

| Model | Max Rating (kW) | Configuration | Dimensional Data | | | | $S_{DS}$ | z/h | UUT |
|---|---|---|---|---|---|---|---|---|---|
| | | | Max Length (in) | Max Width (in) | Max Height (in) | Max Weight (lbs) | | | |
| 60REOZJC | 60 | Open | 114.0 | 42.0 | 58.6 | 3,456 | 1.93 | 1.0 | UUT 1B |
| | | Enclosed | 114.0 | 42.0 | 92.0 | 4,228 | 1.93 | 1.0 | UUT 1A / 1C |
| 80REOZJF | 80 | Open | 134.0 | 44.1 | 64.9 | 4,140 | 1.93 | 1.0 | Interpolated |
| | | Enclosed | 134.0 | 45.5 | 90.0 | 4,929 | 1.93 | 1.0 | |
| 100REOZJF | 100 | Open | 134.0 | 44.1 | 64.9 | 4,380 | 1.93 | 1.0 | |
| | | Enclosed | 134.0 | 45.5 | 90.0 | 5,170 | 1.93 | 1.0 | |
| 125REOZJG | 125 | Open | 174.0 | 44.1 | 79.1 | 5,122 | 1.93 | 1.0 | |
| | | Enclosed | 174.0 | 45.5 | 105.0 | 6,052 | 1.93 | 1.0 | |
| 150REOZJF | 150 | Open | 174.0 | 44.1 | 79.1 | 5,515 | 1.93 | 1.0 | |
| | | Enclosed | 174.0 | 45.5 | 105.0 | 6,526 | 1.93 | 1.0 | |
| 180REOZJG | 180 | Open | 197.2 | 51.2 | 83.7 | 6,630 | 1.93 | 1.0 | |
| | | Enclosed | 197.2 | 52.7 | 119.0 | 7,690 | 1.93 | 1.0 | UUT 2A / 2B |
| 200REOZJF | 200 | Open | 197.2 | 51.2 | 83.8 | 8,080 | 1.93 | 1.0 | Interpolated |
| | | Enclosed | 197.2 | 52.7 | 119.0 | 8,930 | 1.93 | 1.0 | |
| 230REOZJE | 230 | Open | 210.0 | 51.2 | 110.4 | 9,480 | 1.93 | 1.0 | |
| | | Enclosed | 210.0 | 52.7 | 121.0 | 9,930 | 1.93 | 1.0 | |
| 250REOZJE | 250 | Open | 210.0 | 51.2 | 104.0 | 9,480 | 1.93 | 1.0 | |
| | | Enclosed | 210.0 | 52.7 | 121.0 | 10,030 | 1.93 | 1.0 | |
| 275REOZJE | 275 | Open | 210.0 | 51.2 | 110.4 | 9,480 | 1.93 | 1.0 | |
| | | Enclosed | 210.0 | 52.7 | 121.0 | 10,330 | 1.93 | 1.0 | |
| 300REOZJ | 300 | Open | 220.0 | 51.2 | 91.5 | 9,388 | 1.93 | 1.0 | |
| | | Enclosed | 220.0 | 52.7 | 121.0 | 10,238 | 1.93 | 1.0 | |
| 350REOZJB | 350 | Open | 343.0 | 102.0 | 120.0 | 16,500 | 1.93 | 1.0 | |
| | | Enclosed | 379.0 | 102.0 | 133.0 | 19,000 | 1.93 | 1.0 | |
| 400REOZJB | 400 | Open | 343.0 | 102.0 | 120.0 | 16,500 | 1.93 | 1.0 | |
| | | Enclosed | 379.0 | 102.0 | 133.0 | 19,000 | 1.93 | 1.0 | |
| 500REOZJB | 500 | Open | 343.0 | 102.0 | 120.0 | 16,500 | 1.93 | 1.0 | |
| | | Enclosed | 379.0 | **(58.5)** 102.0 | **(127.0)** ; 133.0 | **(15,900)** ; 19,000 | 1.93 | 1.0 | UUT 3A / 3B |

**Notes**
All tanks tested with and without liquid

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## Table 2 - Open & Enclosed Generators Off Tanks (External Rigid Mounting)

| Model | Max Rating (kW) | Configuration | Dimensional Data | | | | $S_{DS}$ | z/h | UUT |
|---|---|---|---|---|---|---|---|---|---|
| | | | Max Length (in) | Max Width (in) | Max Height (in) | Max Weight (lbs) | | | |
| 80REOZJF | 80 | Open | 91.9 | 34.0 | 47.9 | 2,480 | 1.93 | 1.0 | Extrapolated |
| | | Enclosed | 111.1 | 45.5 | 60.0 | 3,269 | 1.93 | 1.0 | |
| 100REOZJF | 100 | Open | 91.9 | 34.0 | 47.9 | 2,720 | 1.93 | 1.0 | |
| | | Enclosed | 111.1 | 45.5 | 60.0 | 3,510 | 1.93 | 1.0 | |
| 125REOZJG | 125 | Open | 106.3 | 44.1 | 60.1 | 2,702 | 1.93 | 1.0 | |
| | | Enclosed | 139.0 | 45.4 | 69.0 | 3,632 | 1.93 | 1.0 | |
| 150REOZJF | 150 | Open | 116.1 | 44.1 | 60.1 | 3,090 | 1.93 | 1.0 | |
| | | Enclosed | 139.0 | 45.4 | 69.0 | 4,101 | 1.93 | 1.0 | |
| 180REOZJG | 180 | Open | 118.1 | 51.2 | 65.7 | 3,190 | 1.93 | 1.0 | |
| | | Enclosed | 161.2 | 51.2 | 84.0 | 4,250 | 1.93 | 1.0 | UUT 2C |
| 200REOZJF | 200 | Open | 118.1 | 51.2 | 65.8 | 4,240 | 1.93 | 1.0 | Interpolated |
| | | Enclosed | 161.2 | 51.2 | 84.0 | 5,090 | 1.93 | 1.0 | |
| 230REOZJE | 230 | Open | 118.1 | 51.2 | 74.4 | 5,400 | 1.93 | 1.0 | |
| | | Enclosed | 162.3 | 52.7 | 84.9 | 5,850 | 1.93 | 1.0 | |
| 250REOZJE | 250 | Open | 118.1 | 51.2 | 74.4 | 5,400 | 1.93 | 1.0 | |
| | | Enclosed | 162.3 | 52.7 | 84.9 | 5,950 | 1.93 | 1.0 | |
| 275REOZJE | 275 | Open | 118.1 | 51.2 | 74.4 | 5,400 | 1.93 | 1.0 | |
| | | Enclosed | 162.3 | 52.7 | 84.9 | 6,250 | 1.93 | 1.0 | |
| 300REOZJ | 300 | Open | 118.1 | 51.2 | 66.5 | 5,400 | 1.93 | 1.0 | |
| | | Enclosed | 162.3 | 52.7 | 84.9 | 6,250 | 1.93 | 1.0 | |
| 350REOZJB | 350 | Open | 142.9 | 56.1 | 78.5 | 8,600 | 1.93 | 1.0 | |
| | | Enclosed | 232.6 | 58.4 | 91.6 | 11,523 | 1.93 | 1.0 | |
| 400REOZJB | 400 | Open | 142.9 | 56.1 | 78.5 | 8,600 | 1.93 | 1.0 | |
| | | Enclosed | 232.6 | 58.4 | 91.6 | 11,523 | 1.93 | 1.0 | |
| 500REOZJB | 500 | Open | 142.9 | 56.1 | 78.5 | 8,600 | 1.93 | 1.0 | |
| | | Enclosed | 232.6 | 58.4 | 91.6 | 11,523 | 1.93 | 1.0 | UUT 3C |

## Table 3 - Open Generators (External Spring Isolated - No Tanks)

| Model | Max Rating (kW) | Configuration | Dimensional Data | | | | $S_{DS}$ | z/h | UUT |
|---|---|---|---|---|---|---|---|---|---|
| | | | Max Length (in) | Max Width (in) | Max Height (in) | Max Weight (lbs) | | | |
| 550REOZV | 550 | Open | 145.2 | 53.2 | 77.8 | 11,280 | 1.93 | 0.0 | UUT 4 |
| 2500REOZDB | 2500 | Open | 305.0 | 121.0 | 130.0 | 56,500 | 1.93 | 0.0 | Interpolated |
| 2800REOZDB | 2800 | Open | 305.0 | 121.0 | 130.0 | 57,450 | 2.25 | 0.0 | UUT 5 |
| 3250REOZD | 3250 | Open | 319.0 | 121.0 | 130.0 | 57,800 | 1.93 | 0.0 | Extrapolated |

## Table 5 - Tank Matrix

| Series | kW Range | Tank | | UUT |
|---|---|---|---|---|
| | | Gallons | Kohler Part Number | |
| REOZJx | 60 | 147 | GM74926-2 | Extrapolated |
| | | 253 | GM74925-6 | UUT 1 |
| | | 253 | GM74926-3 | Interpolated |
| | | 372 | GM74926-4 | |
| | 80-100 | 215 | GM69240-1 | |
| | | 415 | GM69240-2 | |
| | 125-150 | 316 | GM70816-1 | |
| | | 595 | GM77834 | |
| | **180**-200 | 416 | GM71640-1 | |
| | | 765 | GM71640-2 | UUT 2 |
| | 230-275 | 555 | GM74711-1 | Interpolated |
| | | 944 | GM74929-1 | |
| | 300 | 555 | GM74711-1 | |
| | | 1074 | GM74711-2 | |
| | 350 | 404 | GM85993-1 | |
| | | 774 | GM85993-3 | |
| | | 1,161 | GM85993-5 | |
| | | 1,333 | GM85993-6 | |
| | | 2,644 | GM85993-9 | |
| | 400 | 404 | GM85993-1 | |
| | | 774 | GM85993-3 | |
| | | 1,161 | GM85993-5 | |
| | | 1,523 | GM85993-7 | |
| | | 2,644 | GM85993-9 | |
| | 500 | 468 | GM85993-2 | |
| | | 894 | GM85993-4 | |
| | | 1,523 | GM85993-7 | |
| | | 1,763 | GM85993-8 | UUT 3 |
| | | 2,644 | GM85993-9 | Extrapolated |

## Table 4A - Enclosure Matrix

| Series | kW Range | Enclosure[3] | | | Internal Silencer | Tested / Interpolated / Extrapolated |
|---|---|---|---|---|---|---|
| | | Type | Silencer | Kohler Part Number | Kohler Part Number | |
| REOZJx | 60 | Steel Weather, CA AQMD | No | GM87406-KA9 | N/A | Extrapolated |
| | | Steel Sound Level 2, CA AQMD | No | GM87406-KA8 | | |
| | | Aluminum Sound Level 2, CA AQMD | No | GM87406-KA12 | | |
| | | Steel Weather | Yes | GM87406-KA2 | GM59115 | UUT 1A |
| | | Steel Sound Level 2 | Yes | GM87406-KA1 | | Interpolated |
| | | Aluminum Sound Level 2 | Yes | GM87406-KA5 | | UUT 1C |
| | 80-100 | Steel Weather, CA AQMD | No | GM87407-KA5 | N/A | Interpolated |
| | | Steel Sound Level 2, CA AQMD | No | GM87407-KA4 | | |
| | | Aluminum Sound Level 2, CA AQMD | No | GM87407-KA6 | | |
| | | Steel Weather | Yes | GM87407-KA2 | GM59117 | Interpolated |
| | | Steel Sound Level 2 | Yes | GM87407-KA1 | | |
| | | Aluminum Sound Level 2 | Yes | GM87407-KA3 | | |
| | 125 | Steel Weather, CA AQMD | No | GM87408-KA5 | N/A | Interpolated |
| | | Steel Sound Level 2, CA AQMD | No | GM87408-KA4 | | |
| | | Aluminum Sound Level 2, CA AQMD | No | GM87408-KA6 | | |
| | | Steel Weather | Yes | GM87408-KA2 | GM71385 | Interpolated |
| | | Steel Sound Level 2 | Yes | GM87408-KA1 | | |
| | | Aluminum Sound Level 2 | Yes | GM87408-KA3 | | |
| | 150 | Steel Weather, CA AQMD | No | GM87409-KA5 | N/A | Interpolated |
| | | Steel Sound Level 2, CA AQMD | No | GM87409-KA4 | | |
| | | Aluminum Sound Level 2, CA AQMD | No | GM87409-KA6 | | |
| | | Steel Weather | Yes | GM87409-KA2 | GM71385 | Interpolated |
| | | Steel Sound Level 2 | Yes | GM87409-KA1 | | |
| | | Aluminum Sound Level 2 | Yes | GM87409-KA3 | | |
| | **180**-200 | Steel Weather, CA AQMD | No | GM87410-KA11 | N/A | Interpolated |
| | | Steel Sound Level 2, CA AQMD | No | GM87410-KA10 | | |
| | | Aluminum Sound Level 2, CA AQMD | No | GM87410-KA12 | | |
| | | Steel Weather | Yes | GM87410-KA5 | GM70083 | UUT 2 |
| | | Steel Sound Level 2 | Yes | GM87410-KA4 | | Interpolated |
| | | Aluminum Sound Level 2 | Yes | GM87410-KA6 | | |
| | 230-300 | Steel Weather, CA AQMD | No | GM87411-KA8 | N/A | Interpolated |
| | | Steel Sound Level 2, CA AQMD | No | GM87411-KA7 | | |
| | | Aluminum Sound Level 2, CA AQMD | No | GM87411-KA9 | | |
| | | Steel Weather | Yes | GM87411-KA2 | GM75600 | Interpolated |
| | | Steel Sound Level 2 | Yes | GM87411-KA1 | | |
| | | Aluminum Sound Level 2 | Yes | GM87411-KA3 | | |
| | 350 - **500** | Steel Weather, CA AQMD | No | GM89339-TA1 | N/A | Interpolated |
| | | Steel Sound Level 1, CA AQMD | No | GM89339-TA2 | | |
| | | Steel Sound Level 2, CA AQMD | No | GM89340-TA1 | | |
| | | Aluminum Weather, CA AQMD | No | GM89339-TA3 | | |
| | | Aluminum Sound Level 1, CA AQMD | No | GM89339-TA4 | | |
| | | Aluminum Sound Level 2, CA AQMD | No | GM89340-TA2 | | |
| | | Steel Weather | Yes | GM85624-TA1 | GM78403 | Interpolated |
| | | Steel Sound Level 1 | Yes | GM85624-TA2 | | |
| | | Steel Sound Level 2 | Yes | GM85458-TA1 | GM86791 | |
| | | Aluminum Weather | Yes | GM85624-TA3 | GM78403 | |
| | | Aluminum Sound Level 1 | Yes | GM85624-TA4 | | |
| | | Aluminum Sound Level 2 | Yes | GM85458-TA2 | GM86791 | UUT 3 |

## Table 6 - Engine Matrix

| Series | kW Range | Manufacturer Model | Manufacturer | UUT |
|---|---|---|---|---|
| REOZJx | 60 | 5030HF285 | John Deere | UUT 1 |
| | 80 - 125 | 4045HF285 | John Deere | Interpolated |
| | 150 | 6068HF285 | John Deere | |
| | 180 | 6068HFG82 | John Deere | UUT 2 |
| | 200 | 6068HFG85 | John Deere | Interpolated |
| | 230 - 275 | 6090HF484 | John Deere | |
| | 300 | 6090HFG86 | John Deere | |
| | 350 - 400 | 6135HFG84 | John Deere | |
| | 500 | 6135HFG75 | John Deere | UUT 3 |
| REOZVx | 550 | TAD1642GE | Volvo | UUT 4 |
| REOZDx | 2500 / **2800** / 3250 | 20V4000 G83 | MTU | UUT 5 |

Specific Volvo and MTU engines are the only ones approved for this OSP

## Table 7A - Engine Sub-Component Matrix

| Series | kW | Starter | | | Turbo/CAC Compressor | | |
|---|---|---|---|---|---|---|---|
| | | Manufacturer | Model Number | UUT | Manufacturer | Model Number | UUT |
| REOZJx | 60 | John Deere | R520437 | 1 | John Deere | RE535743 | 1 |
| | 80 | John Deere | RE59595 | Extrapolated | John Deere | RE548748 | Extrapolated |
| | 100 | John Deere | RE59595 | | John Deere | RE548748 | |
| | 125 | John Deere | RE69704 | | John Deere | RE528769 | |
| | 150 | John Deere | RE69704 | | John Deere | RE528769 | |
| | 180 | John Deere | RE605356 | 2 | John Deere | RE532384 | 2 |
| | 200 | John Deere | RE605356 | Interpolated | John Deere | RE532384 | Interpolated |
| | 230 | John Deere | RE605356 | | John Deere | RE532384 | |
| | 250 | John Deere | RE605356 | | John Deere | RE532384 | |
| | 275 | John Deere | RE605356 | | John Deere | RE532384 | |
| | 300 | John Deere | RE605356 | | John Deere | RE532384 | |
| | 350 | John Deere | RE65791 | | John Deere | RE549073 | |
| | 400 | John Deere | RE65791 | | John Deere | RE549073 | |
| | 500 | John Deere | RE65791 | 3 | John Deere | RE549073 | 3 |
| REOZVx | 550 | Volvo | U001T46474 | 4 | Volvo | 4043680 | 4 |
| REOZDx | 2500 / **2800** / 3250 | MTU | 0051510001 | 5 | MTU | XT0210100036 | 5 |

## Table 7B - Engine Sub-Component Matrix

| Series | kW | Fuel Filter Assembly | | | Crankcase Emission Canister Assembly | | |
|---|---|---|---|---|---|---|---|
| | | Manufacturer | Model Number | UUT | Manufacturer | Model Number | UUT |
| REOZJx | 60 | Racor Industries | RE533026 | 1 | Racor Industries | CCV3550KLR01 | 1 |
| | 80 | Racor Industries | RE529643 | Extrapolated | Racor Industries | CCV4500-KLR-01 | Extrapolated |
| | 100 | Racor Industries | RE529643 | | Racor Industries | CCV4500-KLR-01 | |
| | 125 | John Deere | RE529643 | | Racor Industries | CCV4500-KLR-01 | |
| | 150 | John Deere | RE529643 | | Racor Industries | CCV4500-KLR-01 | |
| | 180 | John Deere | RE539766 | 2 | Racor Industries | CCV4500-KLR-01 | 2 |
| | 200 | John Deere | RE539766 | Interpolated | Racor Industries | CCV4500-KLR-01 | Interpolated |
| | 230 | John Deere | RE539766 | | Racor Industries | CCV4500-KLR-01 | |
| | 250 | John Deere | RE539766 | | Racor Industries | CCV4500-KLR-01 | |
| | 275 | John Deere | RE539766 | | Racor Industries | CCV4500-KLR-01 | |
| | 300 | John Deere | RE539766 | | Racor Industries | CCV4500-KLR-01 | |
| | 350 | John Deere | RE523929 | | Racor Industries | CV6001-08L | |
| | 400 | John Deere | RE523929 | | Racor Industries | CV6001-08L | |
| | 500 | John Deere | RE523929 | 3 | Racor Industries | CV6001-08L | 3 |
| REOZVx | 550 | Racor Industries | DRK00123 | 4 | Racor Industries | CV6001-08L | 4 |
| REOZDx | 2500 / **2800** / 3250 | Racor Industries | X54808300001 | 5 | MTU | CV6001-08L | 5 |

## Table 7C - Engine Sub-Component Matrix

| Series | kW | Water Pump | | | Fuel Pump | | |
|---|---|---|---|---|---|---|---|
| | | Manufacturer | Model Number | UUT | Manufacturer | Model Number | UUT |
| REOZJx | 60 | John Deere | RE535043 | 1 | Denso HP3 | R523405 | 1 |
| | 80 | John Deere | R132166 | Extrapolated | Denso HP3 | RE527528 | Extrapolated |
| | 100 | John Deere | R132166 | | Denso HP3 | RE527528 | |
| | 125 | John Deere | R520916 | | Denso HP3 | RE527528 | |
| | 150 | John Deere | R520916 | | Denso HP3 | RE527528 | |
| | 180 | John Deere | R518239 | 2 | Denso HP3 | RE546126 | 2 |
| | 200 | John Deere | R518239 | Interpolated | Denso HP3 | RE546126 | Interpolated |
| | 230 | John Deere | R518239 | | Denso HP3 | RE546126 | |
| | 250 | John Deere | R518239 | | Denso HP3 | RE546126 | |
| | 275 | John Deere | R518239 | | Denso HP3 | RE546126 | |
| | 300 | John Deere | R518239 | | Denso HP3 | RE546126 | |
| | 350 | John Deere | R534005 | | Denso HP3 | R524283 | |
| | 400 | John Deere | R534005 | | Denso HP3 | R524283 | |
| | 500 | John Deere | R534005 | 3 | Denso HP3 | R524283 | 3 |
| REOZVx | 550 | Volvo | 21568471 | 4 | Volvo | SX06 | 4 |
| REOZDx | 2500 / **2800** / 3250 | MTU | X52620200081 | 5 | MTU | X59507300003 | 5 |

## Table 7D - Engine Sub-Component Matrix

| Series | kW | Oil Pump | | | Thermostat | | |
|---|---|---|---|---|---|---|---|
| | | Manufacturer | Model Number | UUT | Manufacturer | Model Number | UUT |
| REOZJx | 60 | John Deere | N/A | 1 | John Deere | N/A | 1 |
| | 80 | John Deere | N/A | Extrapolated | John Deere | N/A | Extrapolated |
| | 100 | John Deere | N/A | | John Deere | N/A | |
| | 125 | John Deere | N/A | | John Deere | N/A | |
| | 150 | John Deere | N/A | | John Deere | N/A | |
| | 180 | John Deere | N/A | 2 | John Deere | N/A | 2 |
| | 200 | John Deere | N/A | Interpolated | John Deere | N/A | Interpolated |
| | 230 | John Deere | N/A | | John Deere | N/A | |
| | 250 | John Deere | N/A | | John Deere | N/A | |
| | 275 | John Deere | N/A | | John Deere | N/A | |
| | 300 | John Deere | N/A | | John Deere | N/A | |
| | 350 | John Deere | N/A | | John Deere | N/A | |
| | 400 | John Deere | N/A | | John Deere | N/A | |
| | 500 | John Deere | N/A | 3 | John Deere | N/A | 3 |
| REOZVx | 550 | Volvo | N/A | 4 | Maxima Technologies | N/A | 4 |
| REOZDx | 2500 / **2800** / 3250 | MTU | X57320500001 | 5 | MTU | N/A | 5 |

## Table 7E - Engine Sub-Component Matrix

| Series | kW | Engine Control Module | | | Air Filter Assembly | | |
|---|---|---|---|---|---|---|---|
| | | Manufacturer | Model Number | UUT | Manufacturer | Model Number | UUT |
| REOZJx | 60 | John Deere | RE528702 | 1 | Baldwin Filters | 780004N-10 | 1 |
| | 80 | John Deere | RE526588 | Extrapolated | Cummins Filtration(4) | FHG14002-301-140-7 | Extrapolated |
| | 100 | John Deere | RE526588 | | Cummins Filtration(4) | FHG14002-301-140-7 | |
| | 125 | John Deere | RE526588 | | Cummins Filtration(4) | FHG14002-301-140-7 | |
| | 150 | John Deere | RE526588 | | Cummins Filtration(4) | FHG14002-301-140-7 | 2 |
| | 180 | John Deere | RE531808 | 2 | Donaldson Co, Inc | D120038-016-140 | Interpolated |
| | 200 | John Deere | RE531808 | Interpolated | Donaldson Co, Inc | D120038-016-140 | |
| | 230 | John Deere | RE531808 | | Donaldson Co, Inc | D120038-016-140 | |
| | 250 | John Deere | RE531808 | | Donaldson Co, Inc | D120038-016-140 | |
| | 275 | John Deere | RE531808 | | Donaldson Co, Inc | D120038-016-140 | |
| | 300 | John Deere | RE531808 | | Donaldson Co, Inc | D120038-016-140 | |
| | 350 | John Deere | RE520954 | | Donaldson Co, Inc | FRG180031-387-140 | |
| | 400 | John Deere | RE520954 | | Donaldson Co, Inc | FRG180031-387-140 | |
| | 500 | John Deere | RE520954 | 3 | Donaldson Co, Inc | FRG180031-387-140 | 3 |
| REOZVx | 550 | Volvo | R41400840 | 4 | Donaldson Co. Inc. | FRG180031-387-140 | 4 |
| REOZDx | 2500 / **2800** / 3250 | MTU | X00E50205261 | 5 | Mann & Hummel | B120376 016-140-7 | 5 |

**Notes**

(4) Cummins Air Filter Assemblies Certified by Shake Test of the 150kW REOZJF Filter on the 180kW REOZJG

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## Table 7F - Engine Sub-Component Matrix

| Series | kW | Block Heater | | |
|---|---|---|---|---|
| | | Manufacturer | Model Number | UUT |
| REOZJx | 60 | Kim Hotstart | TPS101GT8-001 | 1 |
| | 80 | Kim Hotstart | TPS151GT8-001 | Extrapolated |
| | 100 | Kim Hotstart | TPS151GT8-001 | |
| | 125 | Kim Hotstart | TPS151GT8-001 | |
| | 150 | Kim Hotstart | TPS151GT8-001 | |
| | 180 | Kim Hotstart | CB125108-005 | 2 |
| | 200 | Kim Hotstart | CB125108-005 | Interpolated |
| | 230 | Kim Hotstart | CB125108-005 | |
| | 250 | Kim Hotstart | CB125108-005 | |
| | 275 | Kim Hotstart | CB125108-005 | |
| | 300 | Kim Hotstart | CB125108-005 | |
| | 350 | Kim Hotstart | CB125108-005 | |
| | 400 | Kim Hotstart | CB125108-005 | |
| | 500 | Kim Hotstart | CB125108-005 | 3 |
| REOZVx | 550 | Kim Hotstart | KHCL140808-2XX | 4 |
| REOZDx | 2500 / **2800** / 3250 | Kim Hotstart | RECSM11208 | 5 |

## Table 8 - Alternator Matrix

| Series | kW Range | Manufacturer Model | Manufacturer | UUT |
|---|---|---|---|---|
| REOZJx | 60 | 4PX, 4QX | Kohler | UUT 1 |
| | 80 | 4PX, 4RX, 4TX | Kohler | Extrapolated |
| | 100 - 125 | 4RX, 4TX | Kohler | |
| | 150 | 4RX, 4SX, 4TX | Kohler | |
| | 180 | 4SX | Kohler | UUT 2 |
| | 200 | 4SX, 4UA | Kohler | Interpolated |
| | 230 - 300 | 4UA | Kohler | |
| | 350 - 400 | 4M, 5M | Marathon | |
| | 500 | 5M | Marathon | UUT 3 |
| REOZVx | 550 | 5M | Marathon | UUT 4 |
| REOZDx | 2500 / **2800** / 3250 | 10M | Marathon | UUT 5 |

## Table 9 - Radiator Matrix

| Series | kW Range | Manufacturer's Part Number | Manufacturer | UUT |
|---|---|---|---|---|
| REOZJx | 60 | RS-6026 | JB Radiator Specialties | UUT 1 |
| | 80 - 100 | RS-6479 | JB Radiator Specialties | Extrapolated |
| | 125 | RS-6889 | JB Radiator Specialties | |
| | 150 | RS-5847 | JB Radiator Specialties | |
| | 180 | RS-7306 | JB Radiator Specialties | UUT 2 |
| | 200 | RS-5849 | JB Radiator Specialties | Interpolated |
| | 230 - 300 | RS-6977 | JB Radiator Specialties | |
| | 350 - **500** | RS-7311 | JB Radiator Specialties | UUT 3 |
| REOZVx | 550 | Engine Component | Volvo | UUT 4 |
| REOZDx | 2500 / **2800** / 3250 | YT423458 | Young Touchstone | UUT 5 |

## Table 10 - Skid Matrix

| Series | kW Range | Material / Thickness | Manufacturer | UUT |
|---|---|---|---|---|
| REOZJx | **60** - 275 | Carbon Steel / 7 Ga. | Kohler | UUT 1 / 2 |
| | 300 - **500** | Carbon Steel / 0.25" | Kohler | UUT 3 |
| REOZVx | 550 | Carbon Steel / 0.25" | Kohler | UUT 4 |
| REOZDx | 2500 / **2800** / 3250 | Carbon Steel / W18x97 | Lakeland Company | UUT 5 |

## Table 11 - Controller Matrix

| Series | kW Range | Manufacturer Model | Manufacturer | UUT |
|---|---|---|---|---|
| REOZJx REOZVx REOZDx | 60 - 3250 | DEC550 | Kohler | UUT 1 / 2 / 4 / 5 |
| | | DEC3000 | Kohler | Interpolated |
| | | DEC6000 | Kohler | UUT 3 |

## Table 12A - Controller Sub-Component Matrix

| Series | kW | Breaker | | | Emergency Stop Switch | | |
|---|---|---|---|---|---|---|---|
| | | Manufacturer | Material | UUT | Manufacturer | Material | UUT |
| REOZJx REOZVx REOZDx | 60 - 3250 | Square D | N/A | 1 / 2 / 3 / 4 / 5 | Taylor Electric | Plastic | 1 / 2 / 3 / 4 / 5 |

## Table 12B - Controller Sub-Component Matrix

| Series | kW | Vacuum Fluorescent Display | | | Key Selector Switch | | |
|---|---|---|---|---|---|---|---|
| | | Manufacturer | Material | UUT | Manufacturer | Material | UUT |
| REOZJx REOZVx REOZDx | 60 - 3250 | Kohler | 59 x 32 | 1 / 2 / 4 / 5 | Teamex HK Limited | Plastic | 1 / 2 / 4 / 5 |
| | | Noritake Co | 124 x 40 | 3 | Control Switches International | Steel/Plastic | 3 |

## Table 12C - Controller Sub-Component Matrix

| Series | kW | Terminal Block | | | EMCP PCB | | |
|---|---|---|---|---|---|---|---|
| | | Manufacturer | Material | UUT | Manufacturer | Material | UUT |
| REOZJx REOZVx REOZDx | 60 - 3250 | Standard Electric Supply Co. | Plastic | 1 / 2 / 3 / 4 / 5 | Kohler | PCB | 1 / 2 / 3 / 4 / 5 |

## Table 12D - Controller Sub-Component Matrix

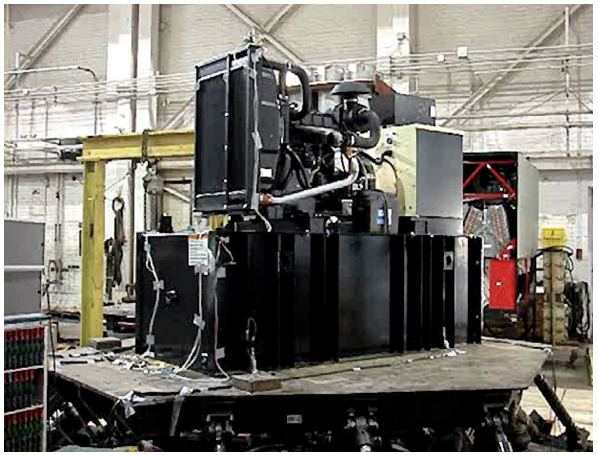
| Series | kW | Intraconnection PCB | | | Main Logic PCB | | |
|---|---|---|---|---|---|---|---|
| | | Manufacturer | Material | UUT | Manufacturer | Material | UUT |
| REOZJx REOZVx REOZDx | 60 - 3250 | Kohler | PCB | 1 / 2 / 3 / 4 / 5 | Kohler | PCB | 1 / 2 / 3 / 4 / 5 |

## Table 8 - Shake Test Matrix

| UUT | Model | Tank | | Enclosure | | Length [in] | Width [in] | Height [in] | Measured Oper Wt [lbs] | Engine Mnf. | Alternator Mnf. | Radiator Mnf. | Controller | | $S_{DS}$ Level | z/h | $A_{FLX-H}$ | $A_{RIG-H}$ | $A_{FLX-V}$ | $A_{RIG-V}$ | Lowest Nat. Freq. | | | Mounting Config. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Capacity | Fill | Style | Material | | | | | | | | Model | Mnf. | | | | | | | X | Y | Z | |
| 1a | 60REOZJC | 230 Gallons | Full | Weather | Steel | 91 | 42 | 86 | 5,725 | John Deere | Kohler | JB Radiator Specialties | DEC 550 | Kohler | 2.46 | 1.0 | 3.94 | 2.95 | 1.64 | 0.66 | 4.7 | 3.1 | 8.6 | Rigid |
| 1b | 60REOZJC | 230 Gallons | Full | N/A | N/A | 91 | 42 | 86 | 5,125 | John Deere | Kohler | JB Radiator Specialties | DEC 550 | Kohler | 2.46 | 1.0 | 3.94 | 2.95 | 1.64 | 0.66 | None | 3.1 | 8.6 | Rigid |
| 1c | 60REOZJC | 230 Gallons | Full | Sound Level 2 | Aluminum | 91 | 42 | 86 | 5,475 | John Deere | Kohler | JB Radiator Specialties | DEC 550 | Kohler | 2.46 | 1.0 | 3.94 | 2.95 | 1.64 | 0.66 | 16.4 | 18.7 | None | Rigid |
| 2a | 180REOZJG | 765 Gallons | Full | Weather | Steel | 197 | 53 | 110 | 14,030 | John Deere | Kohler | JB Radiator Specialties | DEC 550 | Kohler | 1.96 | 1.0 | 3.14 | 2.35 | 1.31 | 0.52 | 3.0 | 5.6 | 8.9 | Rigid |
| 2b | 180REOZJG | 765 Gallons | Empty | Weather | Steel | 197 | 53 | 110 | 8,290 | John Deere | Kohler | JB Radiator Specialties | DEC 550 | Kohler | 2.02 | 1.0 | 3.23 | 2.42 | 1.35 | 0.54 | 3.1 | 5.8 | 9.2 | Rigid |
| 2c | 180REOZJG | N/A | N/A | Weather | Steel | 161 | 53 | 80 | 4,810 | John Deere | Kohler | JB Radiator Specialties | DEC 550 | Kohler | 2.06 | 1.0 | 3.30 | 2.47 | 1.37 | 0.55 | 3.1 | 6.0 | 9.1 | Rigid |
| 3a | 500REOZJB | 1,763 Gallons | Full | Sound Level 2 | Aluminum | 379 | 59 | 127 | 29,030 | John Deere | Marathon | JB Radiator Specialties | DEC 6000 | Kohler | 1.95 | 1.0 | 3.12 | 2.34 | 1.30 | 0.52 | 4.6 | 6.7 | 11.5 | Rigid |
| 3b | 500REOZJB | 1,763 Gallons | Empty | Sound Level 2 | Aluminum | 379 | 59 | 127 | 15,790 | John Deere | Marathon | JB Radiator Specialties | DEC 6000 | Kohler | 1.98 | 1.0 | 3.17 | 2.38 | 1.32 | 0.53 | 4.3 | 6.1 | 11.0 | Rigid |
| 3c | 500REOZJB | N/A | N/A | Sound Level 2 | Aluminum | 230 | 59 | 91 | 9,910 | John Deere | Marathon | JB Radiator Specialties | DEC 6000 | Kohler | 1.93 | 1.0 | 3.09 | 2.32 | 1.29 | 0.52 | 4.7 | 6.3 | 12.1 | Rigid |
| 4 | 550REOZV | N/A | N/A | N/A | N/A | 145 | 53 | 78 | 11,280 | Volvo | Marathon | Volvo | DEC 550 | Kohler | 1.93 | 0.0 | 1.93 | 0.77 | 1.28 | 0.52 | 2.4 | 1.9 | 4.3 | Isolated |
| 5 | 2800REOZDB | N/A | N/A | N/A | N/A | 305 | 121 | 130 | 56,500 | MTU | Marathon | Young Touchstone | DEC 550 | Kohler | 2.25 | 0.0 | 2.25 | 0.90 | 1.50 | 0.60 | 2.3 | 2.8 | 4.3 | Isolated |

All units were full of contents and maintained structural integrity and functionality after testing.

**UUT1a**
Tank is Mounted Directly to the Fixture Using Qty (2) 5/8" Diameter Strain Bolts and Qty (2) 7/8" Diameter Strain Bolts



**UUT1b**
Tank is Mounted Directly to the Fixture Using Qty (2) 5/8" Diameter Strain Bolts and Qty (2) 7/8" Diameter Strain Bolts



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UUT's Cont'd

**UUT1c**
Tank is Mounted Directly to the Fixture Using Qty (2) 5/8" Diameter Strain Bolts and Qty (2) 7/8" Diameter Strain Bolts

**UUT2a & UUT2b (Same Unit Tested With & Without Water)**
Tank is Mounted Directly to the Fixture Using Qty (12) 3/4" Diameter ASTM A490 Bolts

**UUT2c**
Skid is Mounted Directly to the Fixture Using Qty (14) 3/4" Diameter ASTM A490 Bolts

**UUT3a & UUT3b (Same Unit Tested With & Without Water)**
Tank is Mounted Directly to the Fixture Using Qty (14) 3/4" Diameter ASTM A490 Bolts

UUT's Cont'd

**UUT #3c**
Skid is Mounted Directly to the Fixture Using Qty (16) 3/4" Diameter ASTM A490 Bolts

**UUT4**
Skid is Mounted Atop (6) M2SS-1E Seismic Spring Mounts Provided by The VMC Group. The Mounts are Attached to the Fixture Using (4) 3/4" Diameter ASTM 490 Bolts per Mount.

**UUT5**
Skid is Mounted Atop (18) M2SSH-1E Seismic Spring Mounts Provided by The VMC Group. The Mounts are Attached to the Fixture Using (2) 3/4" & (2) 5/8" Diameter ASTM 490 Bolts per Mount.



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